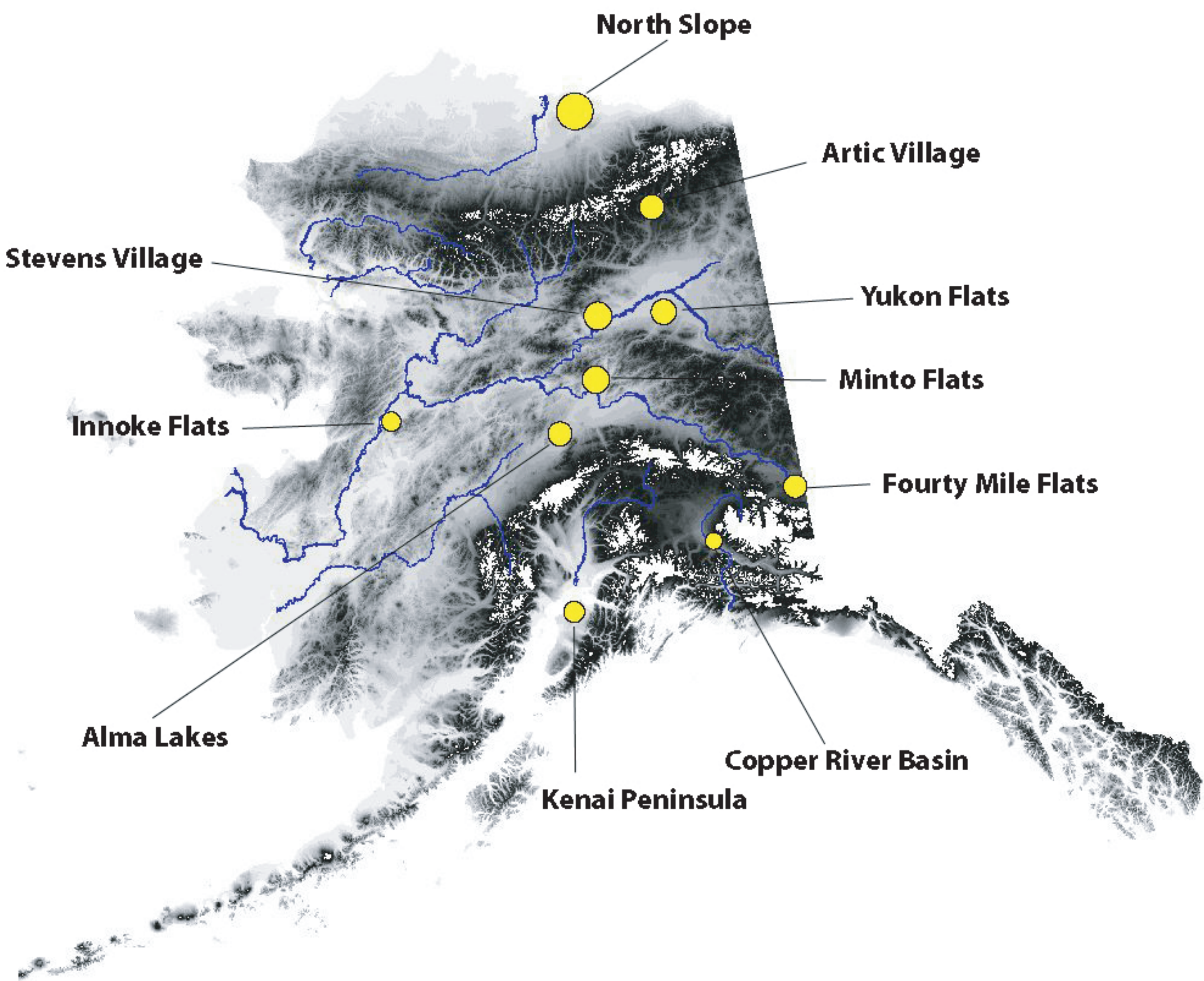


Changes in water levels associated with climate warming in Alaska: Using remote sensing to examine closed basin water bodies across Alaska

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Abstract: The mean global temperature of planet Earth has been slowly rising since the industrial age. Scientists and laymen alike have almost universally accepted the validity of the greenhouse effect. Just recently, over the past twenty years, climactic changes in ecosystems have been attributed to global warming. These observations are primarily evident in the most fragile ecosystems. Arctic and sub-arctic regions are largely comprised of continuous and discontinuous permafrost. Hydrologic systems are intricately related to the entire ecosystem in which they exist. This study is designed to locate and observe the extent of water body loss across Alaska. Furthermore, this study will attempt to pinpoint global warming as a leading factor in the reduction of water bodies. I intend to use digital raster graphics (DRGs), Landsat TM, and Landsat ETM+ satellite images to document this change. This study will incorporate ten sites throughout a north-south, east-west transect in Alaska. These ten sites will be looked at over a 40-year time period.



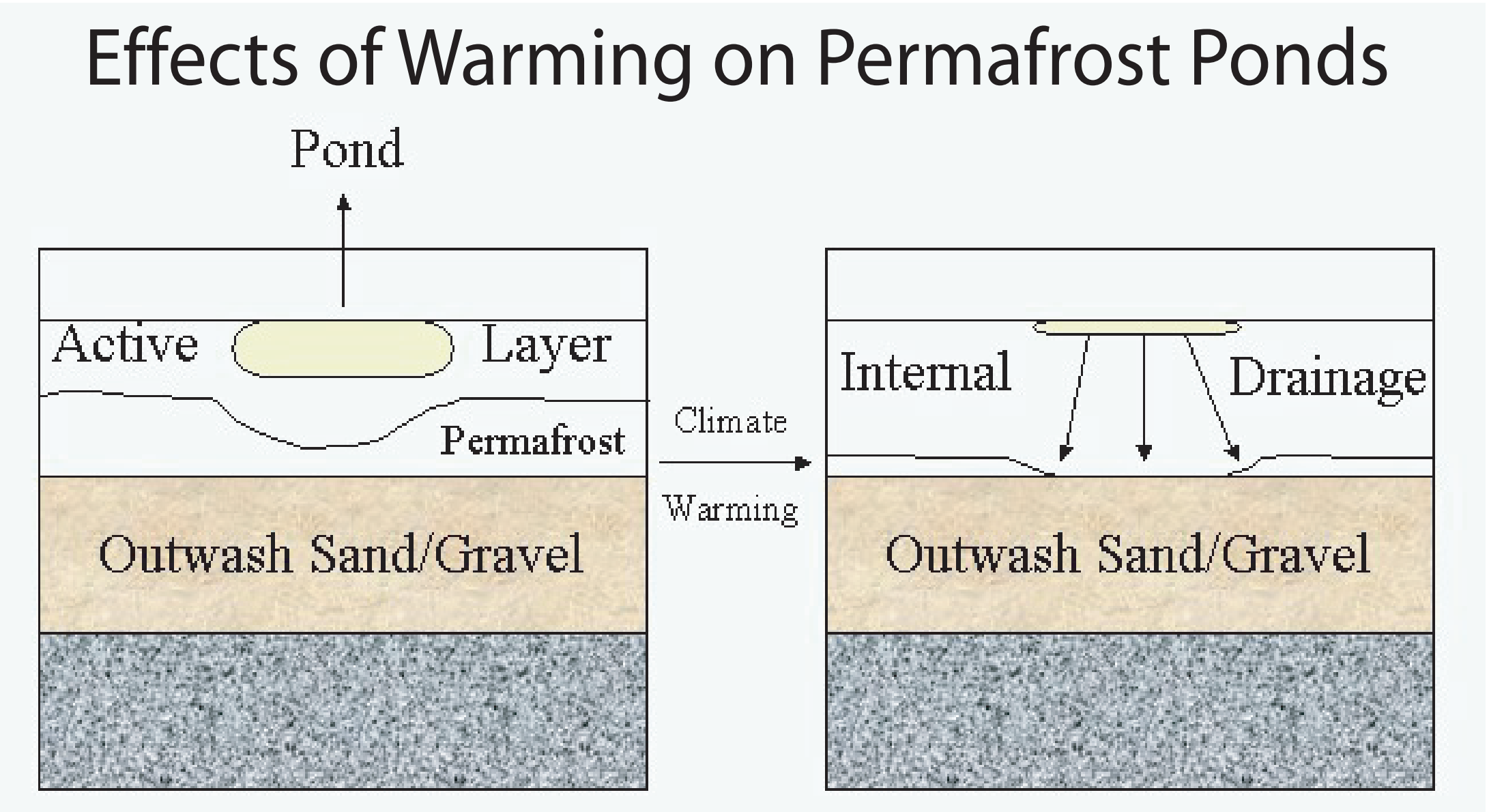
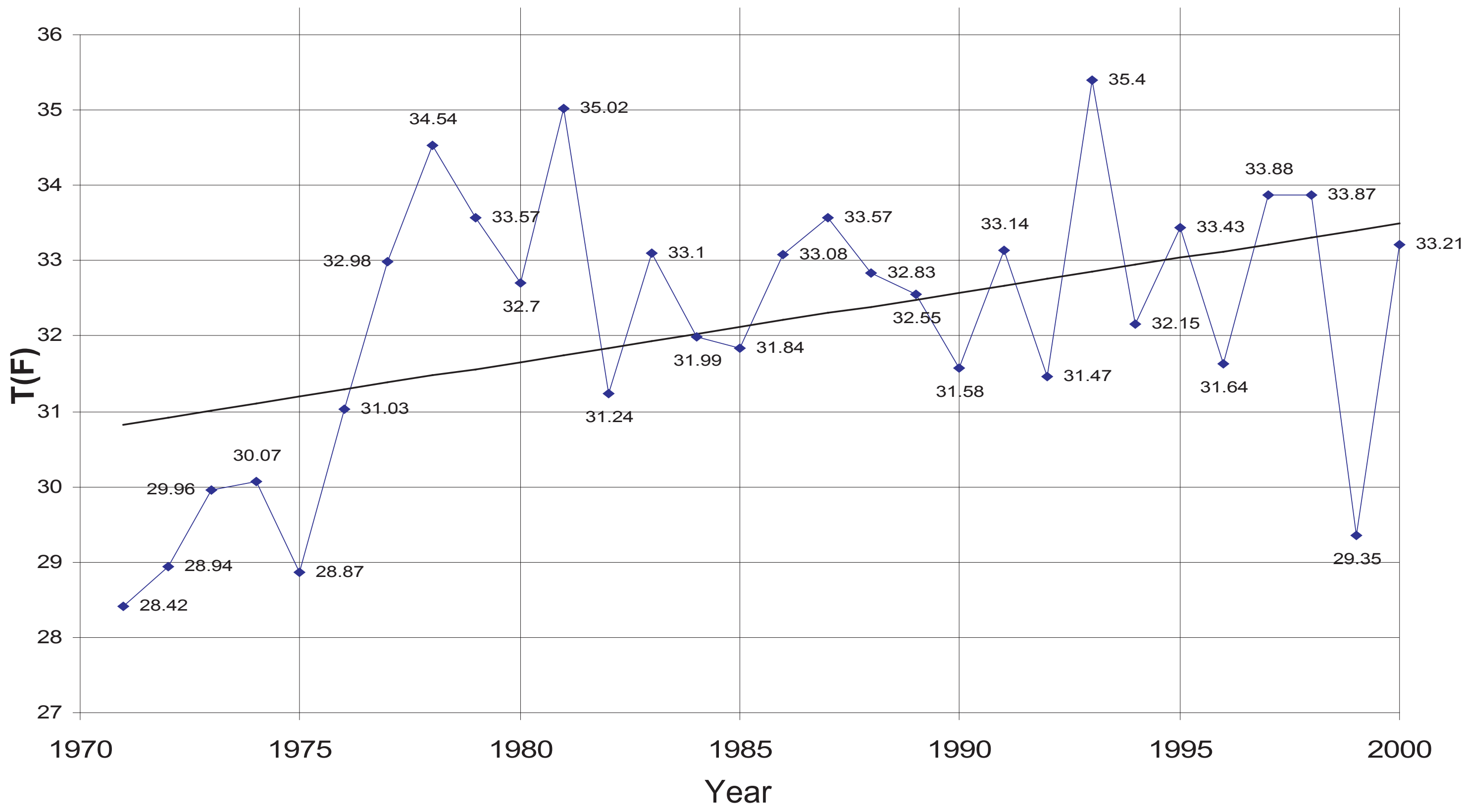
Hypothesis:

There has been a significant decrease in the number of closed basin water bodies in regions of discontinuous permafrost within Alaska over the past 30 years. This loss is attributed, in part, to the mean temperature increase in Alaska.

Methods:

- * Use remote sensing to locate water loss
- * Use 40-year time span to detect change
- * Use ANOVA and multiple regression techniques to locate correlations between temperature, precipitation, and water loss

Mean Annual Temperatures: All Alaska
Weather Stations Included

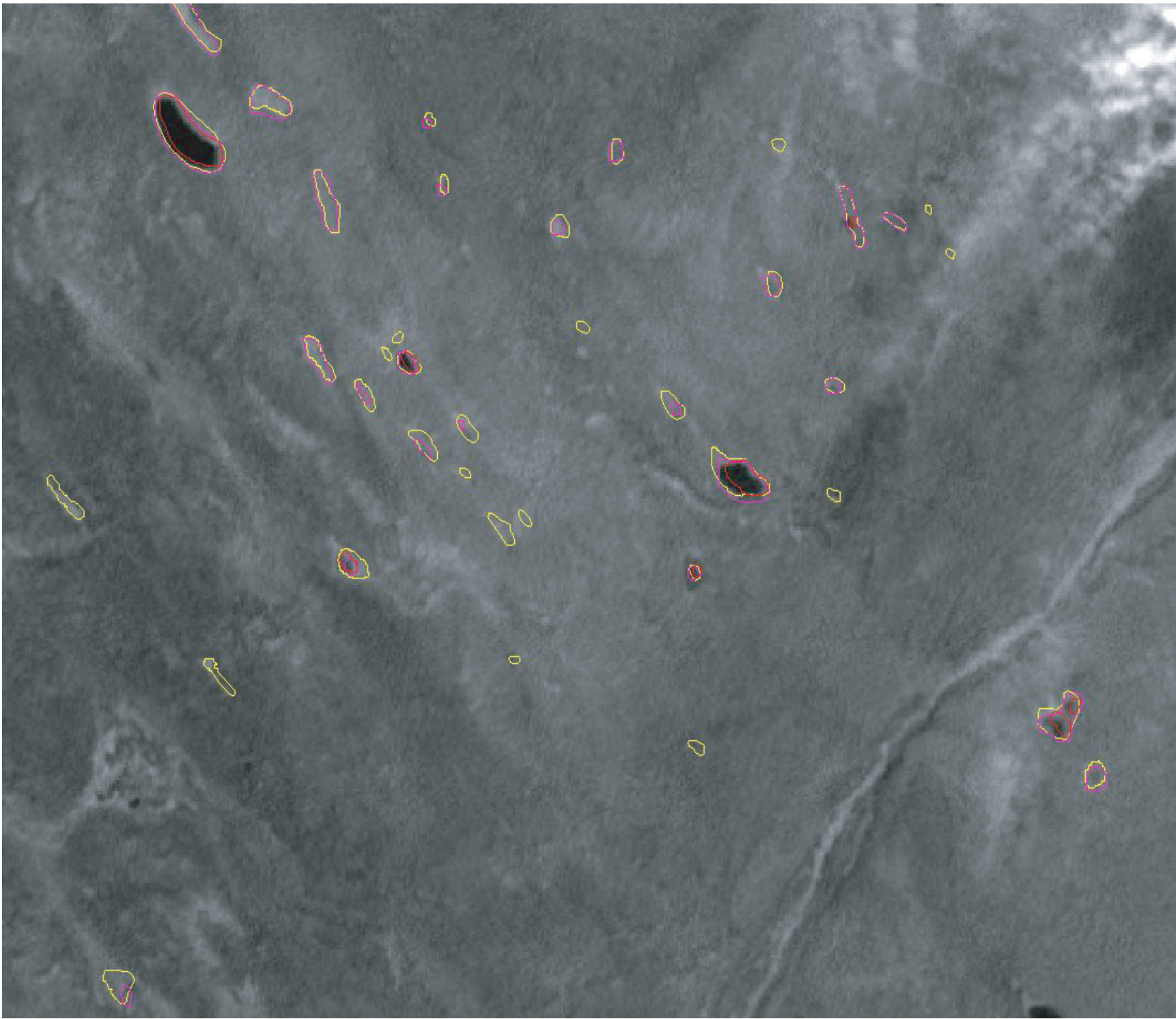
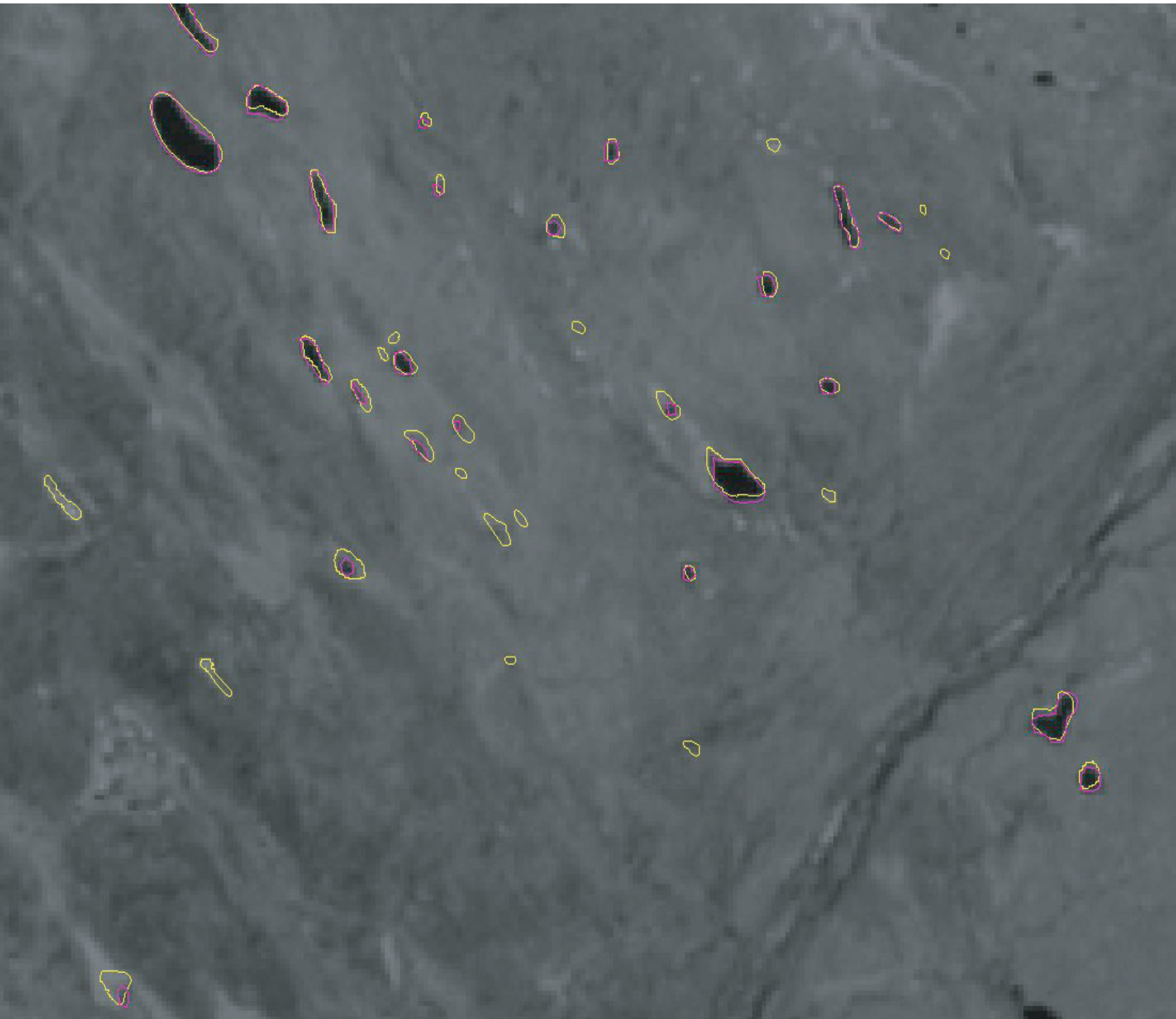
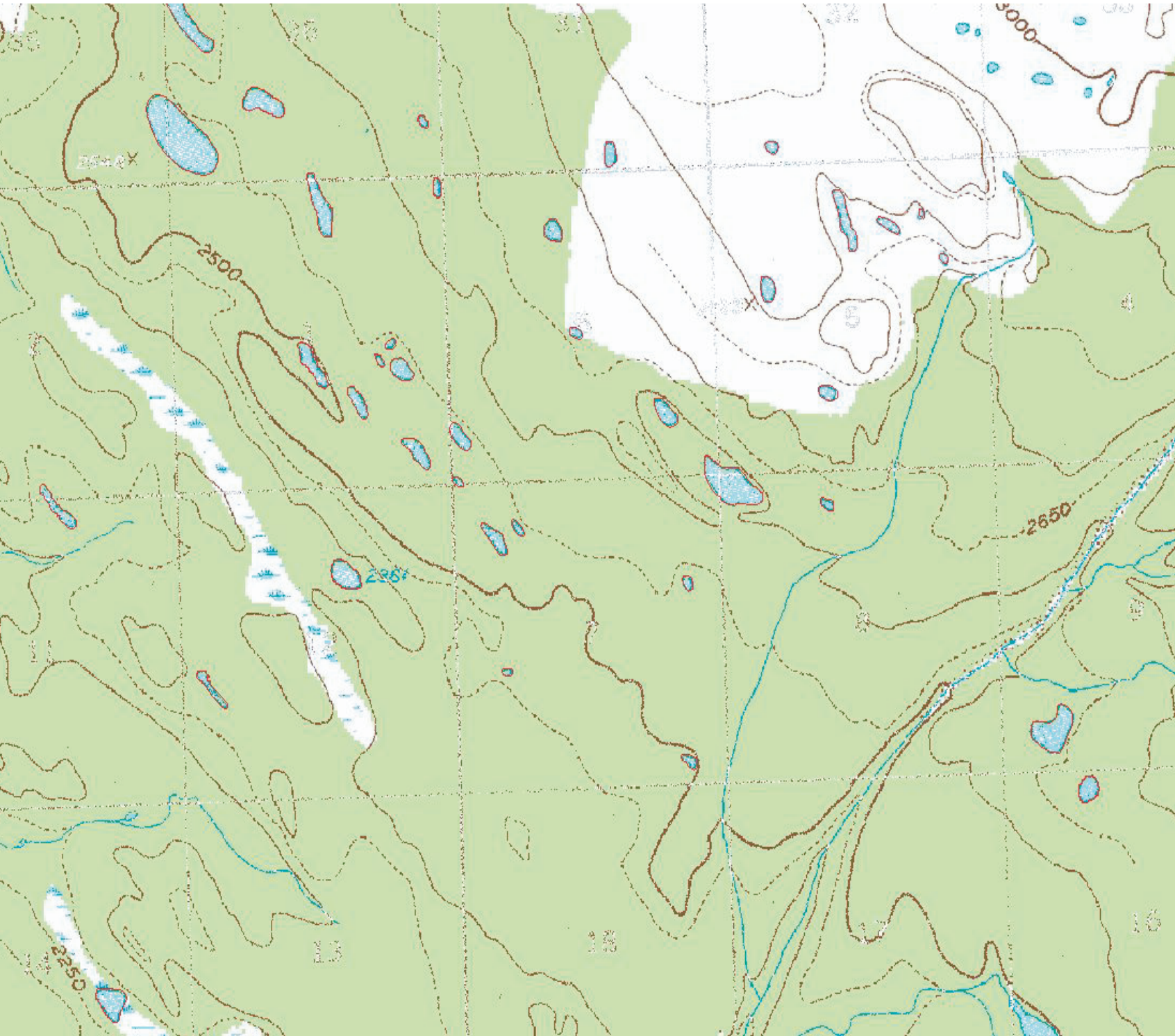


Observations:

- * Alaska has seen a statewide mean temperature increase of more than 2°C
- * Preliminary results indicate significant loss of water bodies
- * The water loss is occurring within areas of discontinuous permafrost
- * Areas of continuous permafrost appear stable

Many ponds within permafrost regions exist because the permafrost acts as an impermeable layer. When this barrier melts the water often drains into the outwash area.

Copper River Basin Series: 1956 - 2001

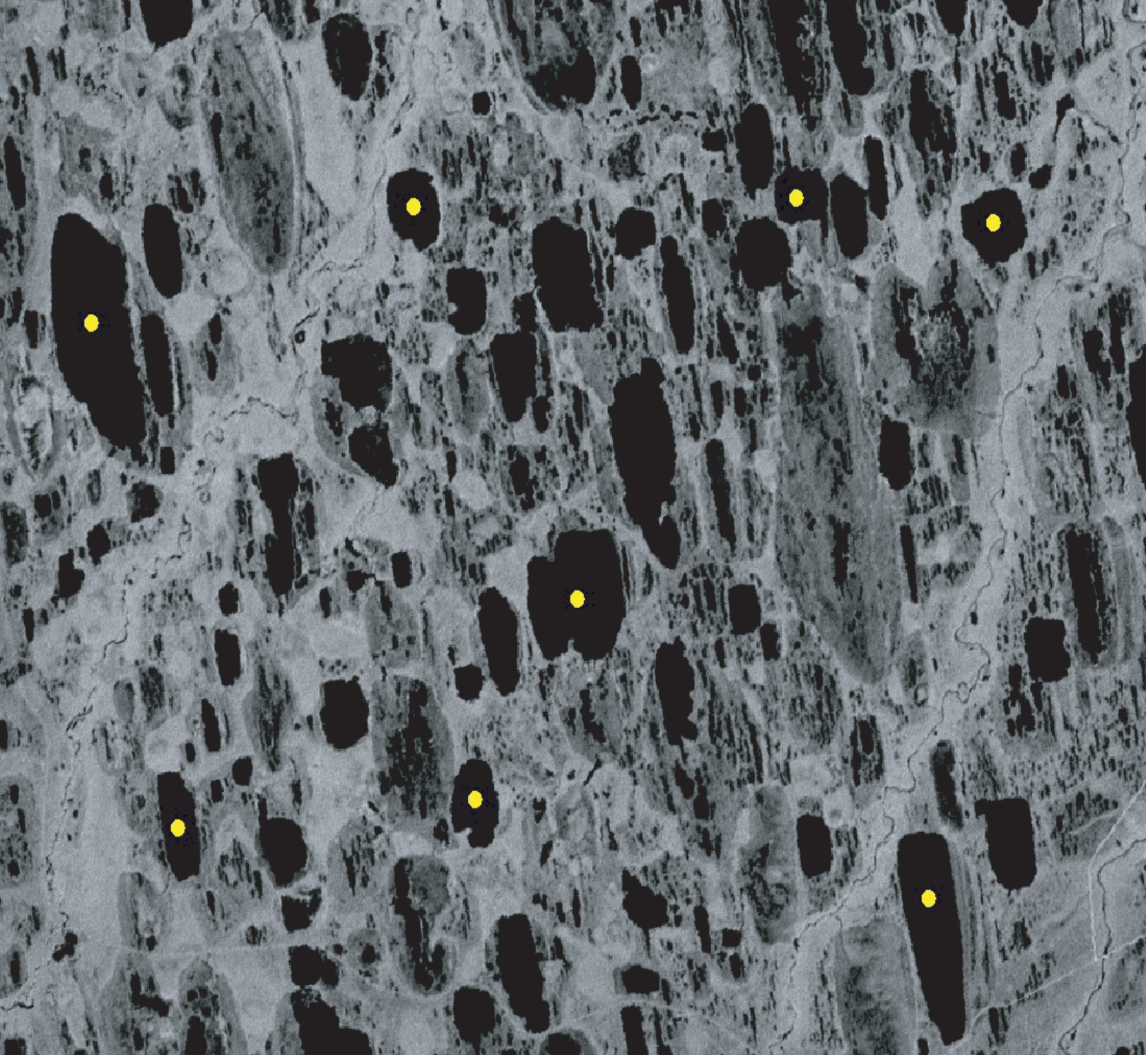
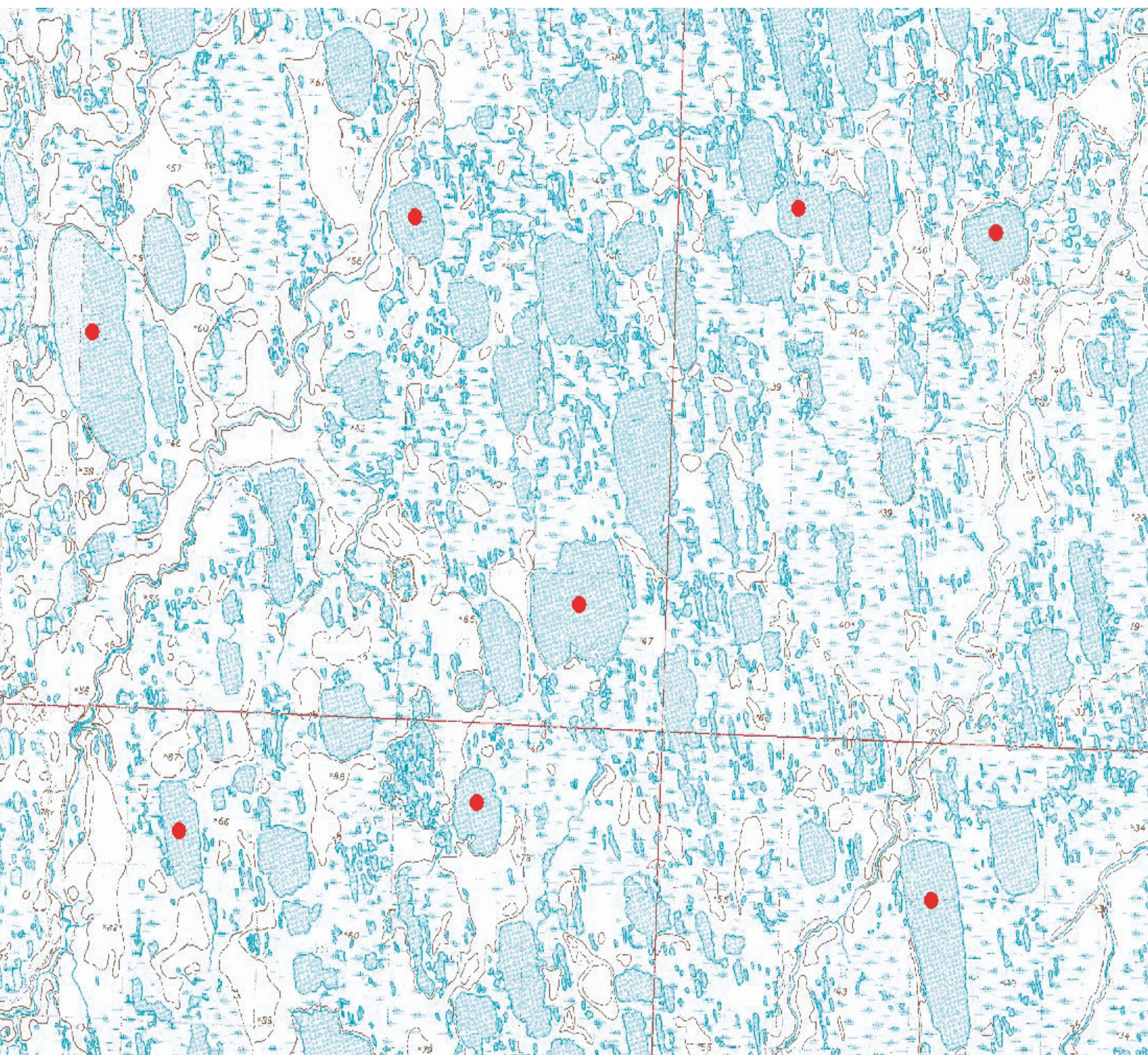


This is a Digital Raster Graphic (DRG) of a sample area created from aerial photographs taken in 1956. Closed basin water bodies are outlined in red. The original photographs will be used in the final project. The next two images show the progression of water loss over the next 40 years.

This is a Landsat 5 TM image from July 30, 1986. The image is displayed in a single band format using Band 5. The water bodies are displayed as black objects in the image. Yellow outlines water bodies present in the DRG and purple outlines current water bodies.

The above Landsat 7 ETM+ image is displayed in the panchromatic band. The yellow outlines still represent the water bodies present in the DRG, as the purple still represent the TM image. Red outlines show the remaining water bodies. There is obviously a significant loss from 1956 to 2001.

North Slope Series: 1956 - 1999



The above left image is a Digital Raster Graphic (DRG) of the north slope from 1956. The above right Landsat ETM+ image is from 1999. The north slope has undergone some of the largest temperature increases yet has experienced very little water body disturbance. The colored dots represent the same water bodies on each image. There is virtually no change between the two images. This is because the permafrost is very thick and far from thawing temperature.